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Japanese Published Unexamined (Kokai) Patent Publication No. S58-180225; Publication Date: October 21, 1983; Application No. S57-64268; Application Date: April 16, 1982; Int. Cl.<sup>3</sup>: B01J 2/30 C01F 11/02; Inventor: Hajime Nakanishi; Applicant: Adachi Sekkai Kogyo Co., Ltd.; Japanese Title: Namasekkaifun no Hyoumen Shori Hou (Surface Treatment for a Quicklime Powder)

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## Specification

### 1. Title of Invention

Surface Treatment for a Quicklime Powder

### 2. Claim

A surface treatment for a quicklime powder, characterized in that the quicklime powder is coated with one or two or more compounds selected from stearic acid, stearyl alcohol, paraffin, ethylene-vinyl acetate copolymer and polyester.

### 3. Detailed Description of the Invention

This invention pertains to surface treatments for a quicklime powder to add flowability and a moisture proof to the quicklime powder by applying a coating onto the particle surface thereof using specific substances.

Since quicklime originally has high reactivity, it absorbs water content in the air to be denatured into slaked lime. The coagulation also increases. For these reasons, it is difficult for quicklime to be handled during a storing, a discharging and a transporting. When the quicklime is pulverized into a powder, the moisture absorbance and the coagulation are further enhanced. A lump of quicklime is usually often used in lieu of the

powder form. Accordingly, in the recent years, the use of a quicklime powder at a lower cost is required with respect to a new technology and an energy-saving, such as a blowing in a molten [illegible] as a pretreatment for a converter mill in the iron and steel related field and the use of a sublimation heat at a production of lime milk at the chemistry related field. However, the use of quicklime is interrupted in the present situation due to instability of quicklime as described above.

The inventor has eagerly studied a quicklime powder treatment that can correspond the aforementioned requirement. As a result, the inventor has found that, by applying a coating to a quicklime powder, of one or two or more compounds selected from stearic acid, stearyl alcohol, paraffin, ethylene-vinyl acetate copolymer and polyester, the moisture absorbance during the storage and the coagulation are controlled, the flowability during the transportation is improved, and that the reactivity can be recovered anytime if necessary. The invention is finally attained.

According to the method of the invention, the specific compounds are preferably used for the coating in the form of solutions wherein they are dissolved in proper solvents. As for proper solvents, toluene, n-hexane and ethylene chloride can be used. One or two or more of these solvents are used. The amount of the compounds used for the coating varies by the types of the compounds. The amount is usually 0.5 to 5.0% (weight % to the quicklime powder; henceforth referred to as the same), preferably 0.5 to 2.0%. If the amount is below 0.5%, desired flowability and moisture resistance is not achieved. If the amount exceeds 5.0%, the effect corresponding to the amount of the compounds to be used does not improve. As a result, a negative effect is sometimes given to reactivation of the compounds.

A preferable surface treatment of the invention is as below. A solution obtained by dissolving one or two or more of desired compounds is first supplied, sprayed or immersed into a quicklime powder immediately after it has been pulverized. After these components have been mixed and sufficiently agitated, a mixture is obtained and then set aside. Or if necessary, the mixture is slightly heated to evaporate the solvents and dry it.

As the quicklime surface-treated as obtained above has sufficient flowability and high moisture resistance, it does not denature or absorb moisture during the storage and the transportation so as not to coagulate. The quicklime powder is extremely easily handled.

The surface treated quicklime powder obtained by the invention can be returned to the original activity anytime by heating it. The temperature necessary for reactivation is 300°C or higher. For example, if the quicklime powder is heated at about 400°C for 10 minutes, it can sufficiently recover the original activity.

The method of the invention is described next with reference to the embodiments.

#### Embodiment 1

6 l solutions wherein stearic acid at 5g, 20g and 30g are dissolved in toluene are prepared. They are individually added to a quicklime powder at 1 Kg, which is obtained by pulverizing a lump of quicklime. After the mixtures have sufficiently been blended, they are set aside for about 5 hours in a natural drying fashion. Three types of surface treated quicklime powders at 0.5%, 2% and 3% are finally obtained.

#### Embodiment 2 to Embodiment 4

Toluene solutions are prepared as similar to as in Embodiment 1 except for the use of stearyl alcohol (Embodiment 2), an ethylene-vinyl acetate copolymer (Embodiment 3) and polyester (Embodiment 4) in lieu of stearic acid. Surface treated quicklime powders at 0.5%, 2% and 3% are obtained after the quicklime powders have been treated with solutions at each concentration.

#### Embodiment 5

A toluene solution is prepared as similar to as in Embodiment 1 except for the use of a stearic acid-paraffin mixture (a 1 to 3 weight ratio) in lieu of stearic acid. After the quicklime has been treated with the solution, a surface treated quicklime is obtained.

The flowability, the moisture resistance and the activities of the surface treated quicklime powders obtained at Embodiment 1 to Embodiment 5 are tested. As for a sample, a surface treated quicklime powder at a 16 mesh pass is used.

#### (Flowability)

The flowability is evaluated by measuring a repose angle. The sample is used immediately after a surface treatment has been applied. The result is indicated in Table 1.

The repose angle of an untreated pulverized quicklime powder (16 mesh pass) is 45.0 degree.

Table 1

Embodiment No.	Amount of compounds (%)		
	[Please refer to the original description]		

As is clear in Table 1, the larger the amount of the compounds, the smaller the repose angle is. The flowability increases. A pipe transportation is usually possible for compounds at a 40 degree or lower repose angle.

(Moisture resistance)

Surface treated quicklime powders at 20g obtained as in Embodiment 1 to Embodiment 5 and an untreated quicklime powder at 20g as a comparative example are released in the air and set aside so as to obtain an about 2 to 4 mm thickness. The weights of the quicklime powders are measured every 24 hours. The weathering ratio thereof is obtained by the following formula:

$$\text{Weathering ratio (\%)} = \frac{b-a}{a} \times 100$$

a: Initial sample weight (g)

b: Sample weight during the measuring (g)

The results are indicated in Table 2 (in the case of 3%), Table 3 (in the case of 2%) and Table 4 (in the case of 0.5%).

Table 2

Embodiment No.	Weathering ratio (%)				
	One day later	Two days later	Three days later	Four days later	Five days later
1					
2					
3					
4					
5					
Comparative example					

Table 3

Embodiment No.	Weathering ratio (%)
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	One day later	Two days later	Three days later	Four days later	Five days later
1					
2					
3					
4					
5					

Table 4

Embodiment No.	Weathering ratio (%)				
	One day later	Two days later	Three days later	Four days later	Five days later
1					
2					
3					
4					
5					

(Reactivation)

The surface treated quicklime powders (0.5% and 3%) obtained as in Embodiment 1 to Embodiment 5 and the activity of the untreated quicklime powder are examined using 4N-HCl by a coarse grain measuring means. The results are indicated in Fig.1 (in the case of 3%) and Fig.2 (in the case of 0.5%).

As is clear in Fig.1 and Fig.2, the activities of the surface treated quicklime powders obtained by the method of the invention are sufficiently controlled. In particular, when stearic acid (Embodiment 1) and the stearic acid-paraffin mixture (Embodiment 5) are used, the activities are significantly controlled.

Each sample (3%) is heated at an electric oven at 400°C for 10 minutes so as to recover the original activity. The activity is measured by a coarse grain measuring means. The result is indicated in Fig.3.

As is clear in Fig.3, the activity returns to that of the untreated quicklime powder.

#### 4. Brief Description of the Invention

Fig.1 and Fig.2 are graphs that illustrate the activities of surface treated quicklime powders individually obtained as in Embodiment 1 to Embodiment 5 and an untreated quicklime powder over time. Fig.3 is a graph that illustrates the activities of the surface treated quicklime powders obtained as in Embodiment 1 to Embodiment 5 after a heating has been applied.

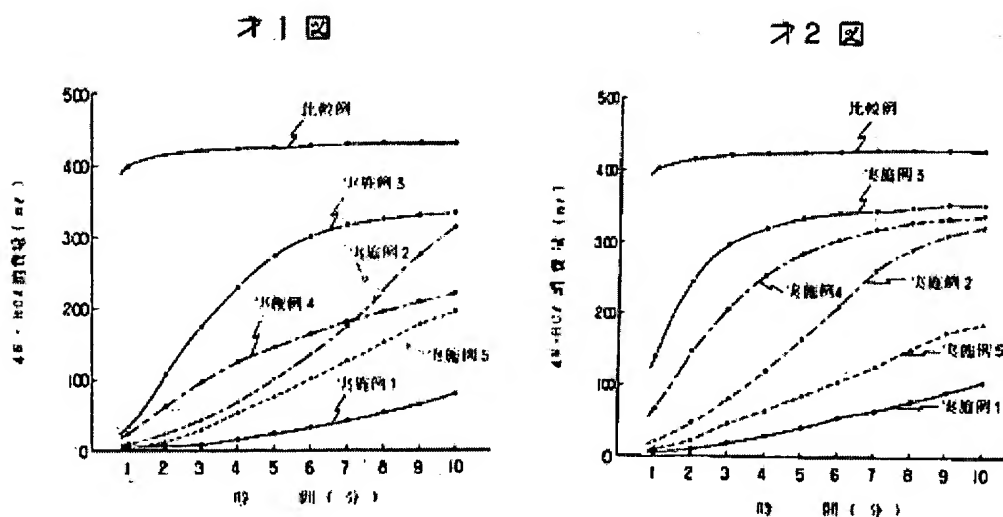


Fig.1:

Vertical axis: Consumptive amount of 4N-HCl (ml)

Horizontal axis: Time (minutes)

Upper lines to lower lines: Comparative example, Embodiment 3, Embodiment 2, Embodiment 4, Embodiment 5 and Embodiment 1

Fig.2:

Vertical axis: Consumptive amount of 4N-HCl (ml)

Horizontal axis: Time (minutes)

Upper lines to lower lines: Comparative example, Embodiment 3, Embodiment 4, Embodiment 2, Embodiment 5 and Embodiment 1

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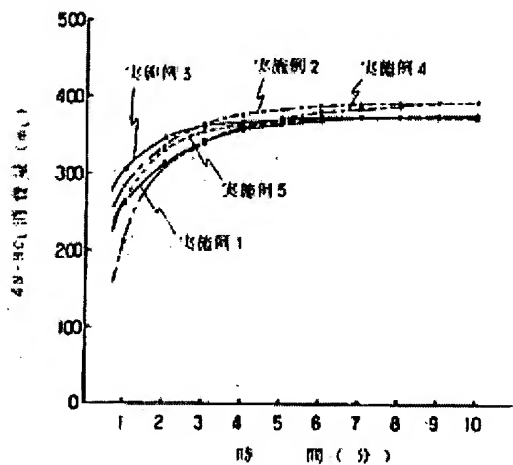


Fig.3:

Vertical axis: Consumptive amount of 4N-HCl (ml)

Horizontal axis: Time (minutes)

Left lines to right lines: Embodiment 3, Embodiment 1, Embodiment 5, Embodiment 2 and Embodiment 4

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